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What has Worked in Europe to Increase Women's Participation in Science and Technology

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The objective of this report is to provide an insight in the current situation of women academics and researchers in the Eastern countries. By 'Eastern countries' we mean the former post-communist countries, which are nowadays the 'new' European Union (EU) Member States + Croatia which is currently in accession process for EU membership. The other objective of the report is to illuminate the European policy of *gender mainstreaming in scientific research* and in particular the large scope of initiatives and measures set up by the European Commission during the decade 1999-2009 in order to increase women's participation in science and technology.

1. Facts and figures: A look at the statistics - Where are we?

The Commission publications '*She Figures 2003*', '*She Figures 2006*' and especially '*She Figures 2009*' are indispensable sources for statistical information for any analysis about the presence of women in science across research and development (R&D) sectors and fields of science and about their under-representation in the higher positions in the academic and research hierarchy as well as in decision-making positions. In addition we could identify some *trends* in different indicators for the period 2001-2007 by comparing the data presented in these three 'She Figures' booklets.

* The views expressed in this paper are those of the author and do not necessarily represent those of the United Nations.

In this section we present the profile of the Eastern countries for the time span 2001-2006 with two kind of comparisons of the available data: a) focusing on the differences among the countries of the Eastern group and b) focusing on the differences between the Eastern group as a whole (the ‘new’ EU member States) and the other (Western) European countries - the ‘old’ EU Member States, or EU-15.

The share of women students at the level of PhD studies (ISCED 6) is an important indicator in the discourse of this report, because a PhD degree is often required to start an academic career. ‘She Figures 2009’ tells us that in 2006 the proportion of female PhD graduates in all Eastern countries except Czech Republic stands above the EU-15 average of **44 %**. In six Eastern countries – Lithuania (59%), Estonia (57%), Bulgaria (53%), Latvia (51), Slovenia (50%) and Poland (50%) the female PhD graduates either outnumber male PhD graduates or are at the same level. (EC, 2009, p.49)

The table below shows some trends of women ISCED 6 graduates share by broad field of study for the time span 2001-2006.

Table 1. Percentage of ISCED 6 graduates who are women, by broad field of study, 2001-2006

	EDUCATION		HUMANITIES & ARTS		HEALTH & SOCIAL SERVICES		AGRICULTURE & VETERINARY		SOCIAL SCIENCES BUSINESS & LAW		SCIENCE MATHEMATICS & COMPUTING		ENGINEERING, MANUFACTURING & CONSTRUCTION		Total	
	2001	2006	2001	2006	2001	2006	2001	2006	2001	2006	2001	2006	2001	2006	2001	2006
Bulgaria	44	52	44	68	52	56	52	54	40	58	46	56	28	33	42	53
Croatia	-	64	-	48	-	44	-	42	-	54	-	58	-	38	-	49
Czech R	63	62	50	42	51	43	31	41	42	41	24	39	27	20	35	36
Estonia	-	100	36	77	65	68	50	100	50	39	32	47	0	59	52	57
Latvia	67	67	50	69	-	48	100	50	67	54	44	36	29	43	49	51
Lithuania	:	-	60	50	44	69	100	75	71	68	45	63	30	40	53	59
Hungary	61	61	42	49	38	39	31	45	43	52	26	39	24	29	38	44
Poland	-	:	49	54	47	54	44	54	44	51	45	57	20	24	42	50
Romania	-	30	-	47	-	49	-	46	-	47	-	62	-	35	-	47
Slovenia	45	75	37	66	54	47	39	57	47	54	45	60	29	22	49	50
Slovakia	81	54	51	46	58	65	69	38	63	52	43	44	23	33	40	47
EU-15	55	64	49	52	49	54	47	52	39	47	36	40	21	25	40	44

2001: Source: She Figures, 2003 - p.23, 43 and 44; 2006: Source: She Figures 2009, p. 49 and 51

The identified trends are as follows: in 2006 in the field of ‘*Science, mathematics and computing*’ all Eastern countries except Latvia show a substantial increase (sometimes more than 10 percentage points) of women graduates share in this field of post-graduate/doctoral study in comparison with the respective figures for 2001. This is true for the Czech female PhD graduates as well, who in 2006 comprised 39% (versus 24 % in 2001) out of all Czech PhD graduates in this field.

The same trend is valid for the field of ‘*Engineering, manufacturing & construction*’ – in all Eastern countries except Slovenia and Czech Republic, one observes an increase in the percentage of women PhD graduates in comparison with the respective data for 2001. For example, in 2006 in the most masculinised field of ‘*Engineering, manufacturing & construction*’ eight Eastern countries had a considerable proportion of female PhD graduates which is above the **EU-27 average of 25%**, e.g. Estonia – 59%; Latvia – 43%; Lithuania –

40%; Croatia – 38%; Romania – 35%, Bulgaria – 33%, Slovakia – 33% and Hungary – 29%. Only three Eastern countries – Czech Republic (20%), Poland (24%) and Slovenia (22%) stand below the EU-27 average. One even could say that in Estonia engineering became a feminized field of study.

Within the period 2001-2006 in the majority of Eastern countries, the annual growth rate in the numbers of female PhD graduates has been higher than that of male graduates in all fields of science, i.e. the trend is that in all fields of science the number of female PhD graduates is increasing more rapidly in comparison with the number of their male counterpart. A similar trend was identified within EU-15. A decrease in the annual growth rate of both female and male PhD graduates in the period 2001-2006 was registered in only two Eastern countries – Estonia (-7.5 - women; -5.3 - men) and Latvia (-3.3- women; -5.5- men).

According to the European Commission ‘She figures 2009’ in 2006 the proportion of female researchers in all Eastern countries except the Czech Republic is above **the EU-27 average of 30%**. On the top place is Lithuania (49%), followed by Latvia (47%), Bulgaria (45%), Croatia (44%), Estonia (43%), Romania (43%), Slovakia (42%), Poland (39%), Slovenia (35%) and Hungary (33%) (EC, 2009, p.28).

Horizontal segregation

The analysis of the gender distribution of researchers across R&D sectors shows that in 2006 the research potential of almost all Eastern countries is concentrated in the Higher Education sector (HES). The highest proportion of researchers (women and men) are employed in the HES in Lithuania (76.9%); Poland (73%); Slovak Republic (71.2%); Latvia (70%); Estonia (64.8%) and Croatia (63.2%). The research potential of Bulgaria is still concentrated in the Government R&D sector (GOV R&D). In five Eastern countries one observes a relatively high proportion of researchers in the Business Enterprise sector (BES) – Czech Republic (33,9%); Slovenia (32,3%); Romania (26,8%); Hungary (23,3%) and Estonia (23,0%). This dissimilarity is indicative for the national specificities of the R&D sectors of the Eastern countries. There is to some degree a balance of the distribution of Czech researchers across BES, HES, and GOV R&D, but nevertheless the Czech HES remain the main employment place for both female and male researchers.

Table 2 below shows the distribution of researchers, including women researchers, by main field of science.

Table 2. Number of researchers (and % of women among them) by main field of science of HES + GOV R&D in the Eastern countries in 2006

Country		Natural sciences	Engineering & technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
Bulgaria	Researchers	3,169	2,884	850	1,078	1,369	1,052
	% women	53.9%	26.9%	53.2%	49.8%	46.2%	61.9%
Czech Republic	Researchers	6,230	6,901	5,088	2,458	4,058	2,873
	% women	31.1%	23.4%	46.9%	37.3%	42.0%	41.6%
Estonia	Researchers	1,629	859	423	231	809	1,109
	% women	38.3%	29.5%	60.8%	48.0%	57.4%	65.1%
Hungary	Researchers	4,486	3,881	4,024	1,613	4,708	6,433
	% women	28.3%	18.7%	46.4%	35.3%	37.1%	48.4%
Latvia	Researchers	1,662	1,073	449	588	1,448	987
	% women	41.1%	27.5%	56.3%	50.3%	59.5%	67.3%
Lithuania	Researchers	2,530	2,079	1,214	471	2,323	2,378

	% women	45.2%	28.8%	54.5%	53.1%	62.0%	61.9%
Poland	Researchers	17,026	18,426	15,537	7,347	16,951	9,555
	% women	39.2%	21.8%	55.1%	40.5%	46.9%	45.3%
Romania	Researchers	3,493	7,911	2,425	2,733	4,653	823
	% women	50.2%	39.7%	55.3%	28.8%	50.6%	41.1%
Slovak Republic	Researchers	4,205	4,143	2,342	1,308	4,201	1,018
	% women	39.2%	32.3%	59.9%	41.7%	53.1%	46.5%
Slovenia	Researchers	1,155	1,269	1,114	546	754	744
	% women	34.7%	22.3%	50.2%	50.5%	45.9%	49.3%
Croatia	Researchers	1,282	1,876	2,435	855	1,814	1,247
	% women	46.2%	30.2%	51.6%	42.3%	46.6%	52.90%
Eastern countries – 11	Researchers	46,867	51,302	35,901	19,228	43,088	28,219
	% women	39.4%	26.5%	52.9%	39.7%	47.8%	49.5%

Source: Own calculation based on compilation of 'She Figures 2009' tables: Annex 2.4 and Annex 2.5 (p. 112-113)

In five Eastern countries the share of women researchers in the field of '*Natural sciences*' is above the Eastern countries average of 39.4% , e.g. in Bulgaria (53.9%) followed by Romania (50.2%), Croatia (46.2%), Lithuania (45.2%) and Latvia (41.1%). In the field of '*Engineering and technology*' Romania and Slovakia rate highest (39.7% and 32.3% respectively) followed by Croatia (30.2%) and Estonia (29.5%). In the majority of the Eastern countries female researchers outnumber male researchers in the field of 'Medical sciences', while in the fields of 'Social Sciences' and "Humanities' there are to some degree more balanced representation of the two sexes.

Vertical segregation

According to the statistical data on the 'proportion of female academic staff at **GRADE A** (Full Professor)' in 2007, the Eastern countries could be divided into two subgroups: countries which stand above **the EU-27 average of 19%**: Romania – 32% (in 2004 - 29.1%), Latvia – 29% (in 2004 - 26.5%), Croatia (26%), Bulgaria – 24% (in 2004 - 18%), Slovakia – 20% (in 2004 - 13.5%), Poland – 20% (in 2004 - 19.5%), and Hungary – 19% (in 2004 - 15.4%). Close to this subgroup is Portugal – 21% (in 2004 - 20.9%) and Finland – 23% (in 2004 - 21.2%); the other subgroup stands below the EU-27 average and either at the level of **EU-15 of 17%** or below it. This smaller group includes: Estonia – 17% (in 2004 - 17.2%), Slovenia – 17% (in 2004 - 12.9%), Lithuania – 14% (in 2004 – 12.1%) and the Czech Republic – 13 % (in 2004 - 10.3%). According to this statistic, the case of the Czech Republic is closer to that of the countries such as Austria, Germany, Denmark and the Netherlands. In terms of vertical segregation the most dramatic situation is in Lithuania. In 2006, 78.2% of Lithuanian female researchers were employed in HES and their share in HES was 50%. However, despite these impressive figures, in 2007 the proportion of Lithuanian female academics at 'Grade A', due to the very thick 'glass ceiling index' (GCI), was only 14% (in 2004 – 12.1%). Therefore Lithuania is *an extreme case* among the group of Eastern countries. The situation of Lithuanian female academics with regard to promotion to higher academic positions is more difficult, even in comparison with the case of the Czech Republic. The two countries have a comparable proportion of female academics at 'Grade A' (14% and 13% respectively), but there are 52.8% of Czech female researchers employed in HES (78.2% for Lithuania) and their respective share is 35% (50% for Lithuania) in this sector.

Some good and some bad news for the Eastern academic women may be drawn from the identified trends for the time period 2001-2006 and the recent statistics.

The good news is that in all Eastern countries, except Estonia, the proportion of female academic staff at 'Grade A' (Full professor) increased during the period 2004-2007, and it seems to be a stable trend.

The bad news is that in 2007, despite the existing large pool of Eastern academic women at 'Grade A' in the majority of the Eastern countries (except for Latvia, Estonia, Slovenia and Croatia), the proportion of female heads of universities and equivalent higher education institutions was less than 10%. There are no women appointed in such high-level decision-making position in Lithuania and Hungary. In this regard, the case of Romania is indicative. The proportion of academic women at 'Grade A' is impressive in Romania – 32% and by this indicator Romania ranks at the top for both Eastern and Western countries. However in 2007 the female share among heads of the Romanian universities was only 2%. (EC, 2009, p. 98)

In general the above statistical figures reveal a kind of paradox – on the one hand the proportion of female researchers in all Eastern countries (except the Czech Republic) is above **the EU-27 average (30%)**; on the other hand the so-called 'glass ceiling index' (which measures the gap between the progress of men and women in science careers) is **thicker in the Eastern countries** and stands above that of the EU-15. Indeed in 2007 (despite the observed decrease in the values of the 'glass ceiling index' (GCI) for 2004) in the majority of Eastern countries, the GCI was higher or equal to the **EU-15 average of 1.9**, e.g. Lithuania (3.0); Estonia (2.6); Czech Republic (2.2.); Slovakia (2.1.); Slovenia (2.0); Hungary (2.0) and Latvia (1.9). Only in four Eastern countries was the GSI below the EU-15 - Poland (1.8); Croatia (1.5); Bulgaria (1.5) and Romania (1.3). (EC, 2009, p.78) It means that the move of Eastern women researchers into higher position is more difficult in the majority of Eastern countries, in comparison with their female colleagues in the EU-15.

We argue that the identified 'good news' for Eastern women academics, i.e. the visible positive trend towards the improvement of gender equality in HES and GOV R&D, does not originate from the adoption of **new organizational culture** in the respective scientific organizations (universities and research centers) and/or from implementation of gender equality policy in these sectors. Generally speaking, the above statistics are more likely to reflect the current economic situation in Eastern countries and the poor image of science and scientists in Eastern societies, rather than the emergence of a new organizational culture for gender equality in scientific research. Therefore the above statistical data should be interpreted as the interface between science and the economy. We assume that each time a profession becomes low-paid and unattractive, as a rule it tends to be feminized, and vice versa, working in a feminized labour sector might reduce the payment level in the sector itself.

In short the statistics show that despite some progress made during the last decade, gender inequality in science is a persistent phenomenon. In 2007 only 19% of EU-27 professors were women and even less – 17% for the EU-15 (the 'old' EU Member States). At the same time, women's share in decision-making positions was marginal.

The observed situation alarmed European policy makers and from 1999 onwards, the European Commission (following the Council's recommendations) launched a set of concrete initiatives, actions and measures aiming to improve the under-representation of women in science and in decision-making bodies concerned with scientific issues, set against the more general background of the European Union equal opportunity policy.

2. The European policy of mainstreaming gender in scientific research: A decade of initiatives and support for European women academics and researchers (1999-2009)

During the Czech EU Presidency, the European Commission organized a high level EU conference, "Changing research landscapes to make the most of human potential – 10 years of EU activities in 'Women and Science' and beyond", held 14-15 May 2009 in Prague, and aimed at commemorating the tenth anniversary of Europe's activities in the area of women and science. In this section we try to present in brief some milestones of initiatives set up during the decade 1999-2009.

The general vision is that Europe (EU-27) needs *an integrated model*, based on a policy mix that addresses the whole life cycle of the scientific career, from the beginning through all stages up to the highest decision-making positions. This integrated model was termed '*Mainstreaming gender equality in scientific research*'. The 'gender mainstreaming' concept means a synergy of actions on several levels: political will, specific policy for gender equality in scientific research, availability of sex-disaggregated statistics, specific knowledge about the role of gender (gender studies), financial and human resources, and women's representation in decision-making bodies and structures. Gender mainstreaming tools include legislation, engendered budgets, a use of sex-disaggregated statistics, the development of gender studies, awareness raising, and equality training. The connotation of the new concept of 'gender mainstreaming' goes beyond the issue of 'non-discrimination by sex', and addresses *a loss of human potential and a waste of talent*. Restricted careers, or careers that women abandon, are a waste for society as well. The promotion of women in science goes beyond the issue of equal opportunity, because it is also a matter of *enriching research* as such.

The European policy of mainstreaming gender in scientific research involves initiatives, actions and measures that fall along several lines as follows:

A) Initiation of policy forum at European level: Discussion and experience sharing (permanent and temporary Expert Groups and their reports)

In November 1999 the Commission set up the Helsinki Group on Women and Science and the Subgroup of *statistical correspondents* attached to this group. Thirty European countries - EU Member States and Associated countries (including Eastern countries) were represented in the Helsinki group. Thanks to the work carried out by this *permanent Expert Group* during the last decade, a stock of important information now exists about the national policies and equality measures implemented across Europe, as well as statistical data related to vertical and horizontal segregation of women in science. In 2002 the Commission published the Helsinki Group on Women and Science Report '*National Policies on Women and Science in Europe*'. (EC, 2002). The updated version of this Report '*Benchmarking policy measures for gender equality in science*', appeared in 2008, and offers opportunity for measuring the progress made by each European country in promoting gender equality in science. Furthermore, the geographic coverage has been broadened to 38 countries including Croatia, the countries from former Yugoslavia (Bosnia and Herzegovina, former Yugoslav Republic of Macedonia, Montenegro and Serbia), as well as some other countries.

During the decade (1999-2009), the Commission set up several *temporary Expert Groups* which addressed different aspects of women's under-representation in scientific research and elaborated recommendations for the improvement the situation. They are as follows:

ETAN (European Technology Assessment Network) Expert Group on Women and Science was set up by Directorate-General (DG) for Research of the European Commission in 1998. This working group produced the Report on '*Science policies in the European Union: Promoting Excellence through Mainstreaming Gender Equality*' (EC, 2000).

ENWISE (Enlarge Women In Science to East) Expert Group: The Group was launched by the Commission Research Directorate-General in 2002 under action No. 27 of the *Action Plan of the Science and Society Programme of Sixth Framework Programme (FP6)*. Its objective was the assessment of the condition and status of women scientists in the Central and Eastern European countries and the Baltic States. Following the ETAN Report which dealt essentially with the situation of women scientists in the EU-15 Member States, the ENWISE Group produced a similar Report – '*Waste of talents: turning private struggles into public issue. Women and Science in the Enwise countries*'. (EC, 2003) The ENWISE Expert Group is chaired by Professor Ene Ergma and its members are senior scientists from different disciplines, representing academies of sciences, universities, research institutes and administration, as well as business. The ENWISE Group involves independent experts from 10 post-communist countries (nowadays 'new' EU Member states): Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia plus one expert from the former German Democratic Republic and one expert for the Balkan region.

WIR Expert Group (Women in Industrial Research): Created in 2002, the group produced the Report: '*Women in industrial research: A wake up call for European industry*' (EC, 2003).

WiST Expert Group (Women in Science and Technology): In 2006, the WiST working group presented its Report entitled "*Women in Science and Technology: a Business Perspective*" (EC, 2006).

WiST2 Expert Group: This working group produced the Report '*Women in science and technology - Creating sustainable careers*'(EC, 2009).

WIRDEM Expert Group (Women In Research Decision Making). The geographic coverage of Eastern countries analyzed by this Expert Group is: Estonia, Romania, Slovakia and Slovenia. The Report '*Mapping the Maze: Getting more women to the top in research*' appeared as a Commission's publication in 2008 (EC, 2008).

Gender and Excellence Expert Group which focused on the gendered access to research funding and the possible gender (im)balance in terms of success rates of applicants for research funding at the national level in involved countries. The Report '*The Gender Challenge in Research Funding: Assessing the European National Scenes*' appeared as a Commission's publication in 2009. The geographic coverage of this Report consists of 33 countries, including all Eastern countries: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

All Reports are available and can be downloaded as pdf from the home page:
<http://ec.europa.eu/research/science-society/>

B) Setting a number of fixed targets

On 19 February 1999 the DG for Research of the European Commission issued a Communication on the subject: *Women and Science: Mobilizing women to enrich European research* in which it proposed a series of measures to be taken so as to stimulate discussion and the sharing of experience in this field among Member States, and to develop a coherent approach towards promoting women in research financed by the Community. This *first and seminal official document* announced that the Commission intended to make significant efforts to achieve **at least a 40% representation of women on average** in Marie Curie Fellowships, advisory groups and assessment/monitoring panels and consultative Committees throughout FP5. This Communication was presented to the Council of the EU, which with its Resolution of 20 May 1999 on women and science approved the **set target of 40%**.

Following a request from the Council of the EU, in 2004 the European Commission proposed to set targets for women's representation in decision-making positions in science: to increase the number of women in leading positions in public research **to 25 % by 2010**, and the proportion of female new recruitments to **at least 33 % by 2010**. EU Member States were also asked to develop specific indicators to track progress on the following: (1) the gender pay gap for researchers, work-life balance, dual careers, and mobility issues; (2) the attrition of women in research and academia, career progression and promotion, women as patent originators, and women in innovation; and (3) appointment procedures and recruitment strategies for composition of scientific boards. (Rf: Science in Society home page of FP7: <http://ec.europa.eu/research/science-society/>). The publication '*Women and Science: Excellence and Innovation – Gender Equality in Science*' (EC, 2005) is the *second seminal official document* which provides an overview of the full scope of set initiatives and measures aimed at improving gender balance in scientific research.

C) Implementation of the Gender and Science Watch System

In 1999 the DG for Research of the European Commission set up a special *sector* – an administrative body for “Women and Science” and a *working group* recruited across the relevant Commission departments in charge of coordination and executive activities in order to achieve the announced objectives – the increase in the number of women participating in European research financed by the Community and the “40% target” of women’s participation in some activities of FP5.

The new sector ‘Women and Science’ was in charge of the following activities:

- To develop the “Gender and Science Watch System”.
- To coordinate the policy of mainstreaming gender equality at all levels, schemes and stages of FP5.
- To collect and disseminate statistics on the sex of participants in all key actions of FP5.
- To develop indicators for measuring gender equality in FP5.

Prior to the start up of FP6 on 8 & 9 November 2001 the Commission organized the conference “Gender and Research” and announced *several new initiatives* aiming to reinforce the measures that were already in place. They are embedded in the *Action Plan of Science and Society* programme of FP6. The sector “Women and Science” becomes a part of the “Science and Society” Programme of the FP6.

D) Providing financial support for research projects

During the last decade, the DG for Research of the European Commission has supported about 35 projects in the field of women and science.

European Union-funded projects (Rf: research*eu SPECIAL ISSUE | APRIL 2009)

1. Gender and research

UPGEM (Understanding Puzzles in the Gendered European Map, Brain Drain in Physics, Through the Cultural Looking Glass). www.dpu.dk/site.aspx?p=8581

KNOWING (Knowledge, Institutions and Gender: an East-West comparative study) www.knowing.soc.cas.cz

PROMETEA (Empowering Women Engineers' Careers in Industrial and Academic Research). www.prometea.info

GenderBasic (Promoting attention to sex and gender in life sciences research in Europe). www.genderbasic.nl

ELSA (Excellence in the Life Science Area – adding the gender dimension). <http://ki.se>

TRANSGEN (Gender Mainstreaming European Transport Research and Policy. Building the Knowledge Base and Mapping Good Practices). www.sociology.ku.dk/koordinationen/transgen

WOSISTER (Women Scientists in Gender-Specific Technological R&D). www.fpi.lu.se/en/research/wosister

2. Role of women scientists

WONBIT (Women on Biotechnology, Scientific and Feminist Approaches). www.wonbit.net

WS DEBATE (Stimulating Policy Debate on Women and Science Issues in Central Europe). <http://wsdebate.tetalap.hu>

PRAGES (Practising Gender Equality in Science). www.cfa.au.dk/da/forskning

EUROWISTDOM (European Women in Science– TV Drama on Message). www.euroscience.org/eurowistdom.html

IFAC (Female Careers in Science, Engineering and Technology). <http://ifac-project.eu/ifac-project>

CEC-WYS (Central European Centre for Women and Youth in Science). www.cec-wys.org

UNICAFE (Survey of the University Career of Female Scientists at Life Sciences versus Technical Universities) www.unicafe.ee

WOMENCORE (Women in construction scientific research). www.women-core.org/web/

GB MANAGEMENT (Gender Budgeting as an Instrument for Managing Scientific Organisations to Promote Equal Opportunities for Women and Men – With the Example of Universities). www.neww.org/en/description/

3. Education

ROBERTA EU (Girls discover robots). www.roberta-home.eu

GAPP (Gender Awareness Participation Process: Differences in the choices of science careers). www.gendergapp.eu

4. Business and innovation

ESGI (European Studies on Gender Aspects of Inventions – Statistical survey and analysis of gender impact on inventions). www.esgi.eu

FemStart (Universities debate female start-ups). www.femstart.eu

WIST (Women in Innovation Science and Technology). <http://wist.ncl.ac.uk>

5. Databases

DATAWOMSCI (Databases of women scientists).

6. Career choices

WOMENG (Creating cultures of success for women engineers). www.womeng.net

IRIS (Improvement through Research in the Inclusive School). www.irisproject.eu

7. Mentors, models and networks

Tandem Plus Idea (Establishment of international strategic development between leading European technical universities to increase the number of female professors in natural science and engineering). www.idealeague.org/tandemplus

ADVANCE (Advanced Training for Women in Scientific Research). www.advance-project

ENCOUWOMSCI (Training seminars for women scientists). www.cews.org/encouwomsci

EPWS (European Platform for Women Scientists). www.epws.org

SET-ROUTES (Network of women scientists). www.set-routes.org

WOMENINNANO (Strengthening the Role of Women Scientists in Nano-Science). www.womeninnano.de

DIVA (Science in a Different Voice). www.irpps.cnr.it/diva

PALLAS ATHENE (Ambassadors for women and science– use of best practice to strengthen women in research). www.dkfz-heidelberg.de/en/pallas

EUMENT NET (European network of mentoring programmes for women in academia and research). www.eument-net.eu/default.aspx

BASNET (Baltic States network: Women in science and high technology). www.basnet-fp6.eu

NEWS (Network on Ethnicity and Women Scientists). <http://newscientist.ulb.ac.be/>

The EU-backed projects provide different solutions shaped in sets of recommendations and action lines for their implementation, for breaking the pattern, for tackling stereotypes, and for making women visible and recognized.

E) Launching a European Institute for Gender Equality (EIGE) in Vilnius, Lithuania

The Commission envisaged a European Institute for Gender Equality (EIGE) to be set up in Vilnius, Lithuania. The preparatory work took several years and finally the Institute was established in May 2007, initially in Brussels and then moved to its office in Vilnius, Lithuania. The European Institute for Gender Equality is a European agency to support the Member States and the European institutions (in particular the Commission) in their efforts to promote gender equality and to raise awareness of gender issues. EIGE opened its doors in Vilnius on 16 December 2009.

On 8th March 2010, EIGE announced the launch of an ongoing activity, the creation of its future "Women of Europe" database. EIGE encourages nominations from and about the successful 'Women of Europe'. The activity aims to highlight their achievements and success stories, as part of its efforts to disseminate information regarding positive examples of non-stereotypical roles, and to publicise such success stories. Further information about this newly launched Institute can be found on the EIGE website: <http://eige.europa.eu>

Problems and issues at stake: To date, not all EU Member States have expressed their commitment to the EU policy of gender mainstreaming in science by adopting official strategic policy documents in which the reference to gender mainstreaming is present. With regard to the 'new' EU Member States, the Governments of the majority of the Eastern countries (except Bulgaria, Hungary, Poland and Romania) have committed to the EU policy of gender mainstreaming in science, but this commitment has not been backed with financial and administrative resources. If we 'follow the money', we can say that the implementation of gender mainstreaming in science is not central in the Eastern countries because of the scarcity of financial resources to address the issue. In addition, the set target of 40% is still not fully met throughout the EU Framework Programmes with a notable exception of the case of the Marie Curie Fellowships. There are no deadlines for achieving the proposed targets of 25% of women in decision-making positions and 33% for new female recruitments at the national level of the EU Member States.

The case of the Eastern countries: The preparation for EU membership was worked out in the Eastern countries during the so-called 'accession period' in which the candidate countries had to harmonize their national legislations with that of the EU in order to be able to assume the obligations of membership, i.e. the legal and institutional framework, known as the *acquis communautaire*, by means of which the European Union implements its objectives. In regard to this process, at the beginning of the 2000s, all Eastern countries adopted Equal Treatment Legislation in the form of anti-discrimination laws or other relevant legal documents. Therefore legal and direct discrimination on the basis of sex is prohibited in the 'new' EU member states including Croatia (which currently is in the process of negotiation for EU membership). Furthermore, all Eastern countries have set up the institution of 'Ombudsman' to deal with cases of all kinds of possible discriminations – be it by sex, ethnicity, religion, etc. As a result, national policies for '*non-discrimination by sex*' in all fields of social activities, including teaching and research, have been developed in all Eastern countries and ingrained in the respective normative documents and regulations of their HE and the Government R&D sectors.

However there are differences across the Eastern countries in terms of the stage of implementation of the gender equality policy embedded in the Equal Treatment Legislation in their HE and the Government R&D sectors. We make here an important distinction between the '*policy of non-discrimination by sex*' in higher education and research (which is present in all Eastern countries) and its further development as a '*policy of gender mainstreaming in science*' (which is lacking in almost all of the Eastern countries). The EU policy of gender mainstreaming calls for **gender balance** at all levels of the organizational structures of higher education and research institutions, including decision-making bodies, and for the definition of a set of equality measures and target funding for measures, which in the long-run might lead to the achievement of gender balance in scientific research. In this regard, some of the Eastern countries (following the recommendation of the Helsinki group on Women and Science') established national committees for women and science (e.g. Poland, Czech Republic, Slovenia, Bulgaria, etc.), but not all of them allocated specific resources for gender

mainstreaming The other countries set up units for ‘women and science’ at the institutional level of their Ministries of Education and Research, again without allocation of national resources for gender mainstreaming.

A synoptic vision for achieving gender balance in scientific research and leadership (women’s representations in decision-making position in science)

We argue that the issue of *organizational culture* of scientific institutions (universities and research centers) is at the center of the observed situation of women and science; it needs a deep structural change and much modernization. This claim implies a shift in the lens through which the ‘puzzle’ of women in science could be viewed. Instead of encouraging women scientists to fit into the existing science institutional system, we should look to achieve a more gender-sensitive system. In our view, the concept of *organizational culture* could be operationalised through a ‘3Rs-dimension’ model. The three Rs are: **Recruitment – Retention – Recognition**

Recruitment – the crucial topic here is the transparency of selection and appointment procedures and practices at the level of scientific organizations (universities and research centers). The presence of ‘Gender Action Plans’ and/or ‘Programmes for gender equality in science’ are necessary, as well as an office/unit in charge of monitoring the recruitment procedures and in charge of the implementation of gender equality programmes. This unit is supposed to be located within the Human Resource department of the scientific organizations and to serve as a promoter of gender mainstreaming in science, tracking progress towards adequate gender balance at all levels of the academic hierarchy. We believe that the management of gender equality should be considered an element of quality management at the level of scientific institutions.

In 2005 the DG for Research of the European Commission produced the document ‘*The European Charter for Researchers & The Code of Conduct for the Recruitment of Researchers*’. Among the provisions of this document is the issue of ‘gender balance’:

Employers and/or funders should aim for a representative gender balance at all levels of staff, including at supervisory and managerial level. This should be achieved on the basis of an equal opportunity policy at recruitment and at the subsequent career stages without, however, taking precedence over quality and competence criteria. To ensure equal treatment, selection and evaluation committees should have an adequate gender balance’. (EC, 2005a).

However, this important document is a set of recommendations to the EU Member States, which are supposed to take account of it but are not obliged to implement it.

The retention dimension refers to issues such as: work-life balance, dual careers (and mobility), the gender pay gap and researchers’ remuneration, child-care facilities and flexibility.

Work-life balance means a balance between the professional and private life of R&D personnel. Adopting a gender-sensitive policy on this topic will enable women to pursue a scientific career on an equal footing with their male counterparts. Such a policy includes measures like: flexible working hours, temporary possibilities for part-time working, distance working/tele-working, special funds dedicated to women returning to science after career

breaks (resources for returnees) as well as the necessary financial and administrative provisions for governing such arrangements.

Dual careers (and mobility) mean scientist couples, in which both partners, who usually have an academic education, show a high commitment to their professional career, and at the same time attach importance to the care of their partnership and/or family. It is a very sensitive issue especially for early stage researchers in their thirties. At this stage of their lives, they tend to have ‘a nomadic’ lifestyle, switching from one post-doc fellowship to another across different European countries. Studies show that women are more likely than men to move for their partners’ career. The consequences are a decrease in women’s science production rates, a delay in their career promotions, etc. The presence of adequate Dual Career services in scientific organizations (e.g. nurseries and kindergarten for R&D staff) and support for mobile scientist couples are preconditions for equal opportunities in careers’ building.

Child-care facilities in the Eastern countries: The market orientation of the Eastern countries’ economies affected the previous well-developed institutions of childcare facilities, and after the political change there was a shortage of available places in the public nurseries and kindergartens. At the same time appeared a number of private kindergartens as well as private primary schools. However, the monthly fees for children’s enrolment in these new establishments exceed the average monthly income of an academic couple. The same is true for the care facilities for senior people. The quality of services in the public ‘homes for senior people’ is low and the newly emerged private homes for older people are extremely expensive and unaffordable for an academic couple. These developments are of crucial importance for the career building for early career female researchers, but also for experienced female researchers as well. The first group of women is concerned as caregivers for children and the second group as care givers for senior parents and relatives. Therefore, many professional women had to cope with this new situation and had to find a solution. In regard to the duties of childcare and care for senior relatives, the Eastern academic women seem to face more difficulties than their Western counterparts, because their share of the research population is high – from 3 percentage points (in Hungary) up to 19 percentage points (in Latvia) above the EU-27 average of 30%. (EC, She Figures 2009).

At the Barcelona Summit in 2002, some explicit conclusions and targets were defined with regard to the provision of childcare services. Confirming the goal of full employment, the European Council agreed that Member States should remove disincentives to female participation in the labour market and strive by 2010 to provide childcare to at least 90 % of children between 3 years old and the mandatory school age, and at least 33 % of children under 3 years of age. The importance of these targets has been reaffirmed as recently as 2008 in the employment guidelines (2008–10) adopted by the Council. (EC, 2009b) A recent EU Report gives some insight on the provision of childcare services across Europe through a comparative review of 30 European countries. The Table below, which sheds light on the situation in the Eastern countries, is extracted from this Report.

Table 3. The provision of childcare services in the Eastern countries

BG	Limited supply of (and demand for) childcare services for the youngest children.
CZ	The demand for childcare facilities far exceeds supply, especially for the youngest age category. There is also a shortage of pre-school facilities for children below 5 years.
EE	There is a shortage of childcare places for almost all age categories, but especially for children under 3 years.
LV	There is a severe shortage of places in public kindergartens. On average, about 60 % of children attend

	kindergartens.
LT	The availability of childcare services is limited. In addition, there is an insufficient number of places in public kindergartens in most urban and rural areas.
HU	Coverage of nurseries is small and falls far short of meeting the demand of working parents. Supply of kindergarten facilities is more or less adequate, except for smaller rural settlements.
PL	Coverage of nurseries and pre-school arrangements is small and falls far short of meeting the demand of working parents.
RO	Very low coverage. In addition the quality of the services causes problems.
SL	There is a growing inclusion of young children in childcare services. There are, however, large differences between towns and between urban and rural areas.
SK	Limited provision of (and demand for) childcare facilities for the youngest children. After a period of decline, the coverage rate for pre-school arrangements is increasing and is more or less at the level of 1989.

Source: The provision of childcare services. A comparative review of 30 European countries, European Communities, 2009, p.40

Gender pay gap and researchers' remuneration

The equal pay legislation, built on the principle of 'equal pay for work of equal value', was introduced in the Eastern countries since the very beginning of the communist period, and in the Western countries since the 1970s. However, despite the existing equal pay legislation and despite a visible increase (over time) of the overall rate of female employment, the gender pay gap was and still is present in all European countries (Eastern and Western). It is determined by multifaceted, underlying factors, which seem to shape a stable trends such as: concentration of women and men into different segments of the labour market with different remuneration, vertical segregation of women and men into different positions in respective organizational hierarchies, difference between female and male appointments on part-time and full-time positions, education and training, transparency of the pay systems, and last but not least, an uneven division between women and men of domestic work (EC, 2010). Because the existing trend of gender pay inequality across European countries has not appeared to narrow over time, the European Commission (from 2007 onwards) initiated multiple initiatives at the European level, aiming to address the issue of the gender pay gap, e.g. the Commission's Communication on *'Tackling the pay gap between men and women'*, harmonization of the methodology for calculation the gender pay gap across European countries in order to make national data comparable, the use of *'Structure of Earnings Survey'* as a harmonized source of data, etc.

In connection with this scope of activities, two important EU Reports were recently released. One, prepared by the European Network of Experts on Employment and Gender Equality issues (EGGE), was commissioned by the European Commission DG for Employment, Social Affairs and Equal opportunities. It was published in February 2010 and provides an insight into the gender pay gap across the labour markets of the European countries. The other was commissioned by the European Commission DG for Research and was produced in 2007. The *Study on the Remuneration of Researchers in the Public and Private Commercial Sectors* addresses the issue of researchers' remuneration and the gender pay gap across European countries, associated countries and other countries (EC, 2007).

The recognition dimension refers to issues such as: career path, leadership, support for mobility, scientific excellence, peer review system, access to research funding, etc.

Scientific excellence

The EU Report *'Gender and Excellence in the Making'* suggests that existing systems of defining and evaluating scientific excellence are not as gender neutral as they are claimed to be. The scientific community seems to act as if it were obvious and agreed by all participants of the scientific enterprise what scientific excellence means. It behaves as if scientific

excellence were an uncontested terrain, and the procedures and criteria that lead to the selection of the top layer of scientists who are considered excellent were given, known, and unproblematic. (EC, 2004) From a critical view, excellence is a set of practices that are functional to the governance of the scientific community, i.e. to the allocation within the scientific community of resources and decision power. Therefore excellence is procedural, not substantive. Excellence does not exist per se, independently from the practices that create it. What we need is a *critical reflection on procedures and criteria leading to recognized excellence*.

Access to research funding

Gender differences are clearly visible in the process of finding research funding. For example recruitment procedures for peer reviewers are not always transparent. Sometimes the eligibility criteria fail to take into account the constraints of family demands (maternity and child care). The recent EU Report '*The Gender Challenge in Research Funding: Assessing the European National Scenes*' sheds light on the gendered access to research funding across Europe.

The case of the Eastern countries

The recent reforms of R&D in Eastern countries are focused on the further development of competitive research funding in the already established national grant agencies and relevant grant-awarding bodies. The vision is that all R&D funding should become entirely competitive. The move is towards *the internationalisation of the evaluation/review procedure*. The national grant agencies in the majority of Eastern countries revised their evaluation rules and practice to associate foreign experts in the peer reviews of the submitted projects. In the recent EU Report (EC, 2009a), all Eastern experts claimed that their *national agencies are not engaged either with gender equality planning or with gender equality monitoring in all aspects of their activities. For example gender is not taken into account in the selection and recruitment of evaluators, both national and international, the success rate by gender of applicants is not monitored, and any special positive measures for the promotion of women scientists through specific programmes, calls and target funding are lacking*.

Generally speaking, in Eastern but also Western countries, female scientists' applications to national grant agencies seem to be less numerous in comparison with those of their male counterparts, and they tend to apply for smaller size grants. The share of projects with female coordinators/principal investigators among the awarded grants is also low.

What might be the impact of the current process of ongoing reforms in R&D funding systems on the future prospects of Eastern women scientists? In spite of the fact that gender is not taken on board and that any explicit positive measures for achieving gender balance among the grants' beneficiaries were not applied in the recent reforms of national grant agencies, women scientists could still profit from the following developments in this area:

- The 'young scientists' age group (under 35 years old) is a priority for all Eastern countries' national grant agencies, which direct a specific call for projects for young scientists, or offer 'bonuses' to submitted projects that involve young scientists, or target them in many other ways. (EC, 2009a). *Competitive project-based financing*, in the majority of Eastern countries, is based on a kind of 'young scientists mainstreaming' policy. The current aim is to reach *a balance by age and not a balance by gender* in the research projects supported by national grant-awarding

bodies. However, young women scientists, being a part of the *privileged target group* of young scientists, could profit from the current state of affairs.

- Eastern researchers working abroad form another target group. All Eastern countries' national grant agencies make specific calls for reintegration grants addressed to their nationals who have scientific careers abroad. (EC, 2009a). Young as well as experienced female researchers with excellent scientific records who are a part of this *privileged target group* could profit from this policy.
- Some winds of change are observed in the initiated new practice within some national grant agencies to take into account parental leave in the evaluation of the eligibility of applicants for research grants. (EC, 2009a). This new measure was introduced in Slovenian, Estonian and in Czech grant-awarding bodies since 2006 and in Hungary since 2009. These are examples of good practices for the other Eastern countries.

Mobility

Since 2000 the mobility of researchers within the EU is considered a priority in terms of skills' improvement. However, scientists who move from country to country around Europe face different obstacles, e.g. *a lack of pension transfer system* and suitable social security schemes. In the majority of EU countries (except for the UK to some degree), permanent academic positions are rarely given to foreigners, which strongly affect their career paths. Mobile researchers find it almost impossible to build an academic career abroad. The research environment needs more flexibility in order to encourage the mobility and to improve the attractiveness of research careers.

Academic migration and the brain drain issue: a sensitive problem for Eastern countries

We think that the insertion of a *gender dimension* in brain drain issues will provide a more nuanced and contextualized understanding of the brain drain phenomenon, e.g. we value the importance of the wider family context and the life-course in the process of academic migration. Studies show a new trend towards the *feminization of academic migration*. The very process of academic migration incorporates a *gender dimension* that has been highly neglected and under-researched in mainstream research on brain drain issues. Do the *female* brain drainers in Eastern countries face the same problems as their *male* counterparts living and working in a foreign environment? We do not know the answer to this question, but we assume that *gender* plays a crucial role at each stage of the academic migration process – at the stage of decision-making on emigration, at the stage of immigration to the receiving country and at the stage of possible return back to the home country.

The ENWISE Report reveals that women scientists in Central and Eastern European countries and in the Baltic States, facing difficult economic situations, are inclined to accept jobs below their qualification and in general to work for lesser wages, which is rarely the case for their male counterparts. This flexibility of attitude towards the labour market in fact makes them prospective emigrants. In order to understand *the female brain drain*, the following questions might be asked:

- What are the specific *push* and *pull* factors that motivate highly qualified women scientists and engineers in the region to emigrate?
- Are they accepting jobs under their qualification in the host country?
- If female scientists are on the move, what are the effects of this *nomadic lifestyle* on their families and children? (It is not difficult to imagine that a child who accompanies his/her mother on the move has to grow up and acquire an education in several different countries with different cultural milieux and traditions. It is not

difficult to imagine who will return, when the elder members of the family who have stayed in the country of origin need help.)

- How are problems related to the so-called ‘dual academic career’ (i.e. both partners are scientists) managed within the academic migration process?

Some conclusions:

- Neoliberal market values and orientations have affected HES and GOV R&D sectors in both Western and Eastern countries. The focus is set on *competition* both at the level of institutions and individuals and their ability for attracting research funding outside of the allocated state budget subsidies. *Scientific excellence* tends to be measured in terms of this ability. The prospect is for future challenges with regard to gender equality in scientific research. For example current reforms in the mechanisms of R&D funding that are ongoing at a different pace across the Eastern countries do not suggest that the issue of gender equality or gender balance has or will be taken into account.
- There is an urgent need to extend the current ‘*policy of non-discrimination by sex*’ in HES and GOV R&D and in the business enterprise and private non-profit sectors to a ‘*policy of gender mainstreaming in scientific research*’ through a modernization of *organizational culture* in national-level scientific organizations.
- Not only women, but also men scientists should participate in all levels of the debate on gender equality in science..

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